REMARKS

Claims 8-25 are presently in the application. Claims 1-7 were previously canceled. Claim 23 has been amended to delete the reference to reference numeral "10."

Reconsideration of the rejection of claims 8-25 under 35 USC 112, second paragraph, as indefinite is respectfully requested. On page 2 of the final Office action, the examiner objected to the "any reduction of the braking force is imperceptible" language of claims 8 and 20 and the "any reduction of the force exerted is imperceptible" language of claim 9.

The general rule is that terms in the claim are to be given their ordinary and accustomed meaning. See Johnson Worldwide Assoc., Inc. v. Zebco Corp., 175 F.3d 985, 989, 50 USPQ2d 1607, 1610 (Fed. Cir. 1999). The ordinary and accustomed meaning of the term "imperceptible" is "**1** very slight; gradual; **2** that cannot be perceived or felt; subtle or indistinct." The World Book Dictionary, Vol. 1, p. 1058 (1987).

Applicant's specification teaches that

> For actuating the wheel brake assembly in the release direction, the electric motor need not necessarily be supplied with current in the release direction; often, it suffices to interrupt its current supply or reduce it, before the electric motor is again acted upon with maximum current supply in the tightening direction in order to re-tighten the wheel brake assembly. Nor is the wheel brake assembly actually released; instead, the actuation in the release direction is so brief that the braking force is reduced, if at all, only imperceptibly. It is not the goal of the invention to reduce the braking force of the wheel brake assembly temporarily and then increase it again; instead, by actuating the wheel brake assembly in the release direction, any stresses in bearings, gears, guides and the like, which can occur in the quasi-static terminal state because of the high tightening force of the wheel brake assembly, are meant to be reversed, and the static friction is to be overcome. An explanation for why the

braking force of the wheel brake assembly does not decrease despite a brief actuation in the release direction could be hysteresis resulting from the elasticity of the wheel brake assembly. In any case, in experiments, no loss of braking force during the brief actuation of the wheel brake assembly in the release direction was measurable. This can be due to the fact either that the braking force in fact did not decrease, or that the decrease in braking force was less than the measurement precision and hence was insignificant. <u>A perceptible reduction in the braking force during the actuation of the wheel brake assembly in the release direction would be quite worrisome to a driver and would moreover lengthen the braking distance, which should be avoided and is unwanted according to the invention. What is meant by the expression that the braking force is reduced if at all only imperceptibly is that the wheel brake assembly is actuated in the release direction only so briefly that any stresses in the drive of the wheel brake assembly will be reversed and the static friction will change into a sliding friction</u>. (Emphasis supplied)

Specification, paragraph [0012].

Thus, what is meant by - - any reduction of the braking force is imperceptible - - is that any reduction of the braking force is so slight that it cannot be perceived or felt by a driver applying the braking force. This is accomplished in applicant's invention by actuating the wheel brake assembly in the release direction only so briefly that any stresses in the drive of the wheel brake assembly will be reversed and the static friction will change into a sliding friction.

> A fundamental principle contained in 35 U.S.C. 112, second paragraph is that applicants are their own lexicographers. They can define in the claims what they regard as their invention essentially in whatever terms they choose so long as the terms are not used in ways that are contrary to accepted meanings in the art. Applicant may use functional language, alternative expressions, negative limitations, or any style of expression or format of claim which makes clear the boundaries of the subject matter for which protection is sought. As noted by the court in <u>In re Swinehart</u>, 439 F.2d 210, 160 USPQ 226 (CCPA 1971), a claim may not be rejected solely because of the type of language used to define the subject matter for which patent protection is sought.

MPEP, 2173.01.

The test for definiteness under 35 U.S.C. 112, second paragraph is whether "those skilled in the art would understand what is claimed when the claim is read in light of the specification." Orthokinetics, Inc. v. Safety Travel Chairs, Inc., 806 F.2d 1565, 1576, 1 USPQ2d 1081, 1088 (Fed. Cir. 1986). Under this test, the language objected to by the examiner is clearly definite and in full compliance with the requirements of 35 U.S.C. 112, second paragraph.

The examiner also questions whether applicant's reference to "the wheel brake assembly" in lines 1-2 of claim 23 is meant to be a reference to "the electric motor." The examiner is advised that "the wheel brake assembly" language was the intended language. The examiner has rejected the claim under 35 U.S.C. 112, second paragraph, but has not set forth reasons for the rejection in the statement of the ground of rejection. The applicant is entitled to know why claim 23 has been rejected under 35 U.S.C. 112, second paragraph. Since no reasons for the rejection are set forth in the statement of the ground of rejection, withdrawal of the rejection of claim 23 is requested.

Reconsideration of the rejection of claims 8-25 under 102(a) as anticipated by Schenk et al (US 5,090,518) is also respectfully requested. In electromechanical wheel brake assemblies of the prior art, an electric motor is supplied with current in the tightening direction, until a desired braking force is reached. However, the braking force of prior art electromechanical wheel brake assemblies can only be increased until such time as a quasi-static terminal state is reached, at which point the torque of the electric motor, at maximum current supply, no longer suffices to further increase the contact pressure of the friction brake lining against the brake body. Applicant has discovered

that by performing applicant's claimed method, the braking force of the wheel brake assembly can be increased by approximately one-third compared to the value in the quasi-static terminal state. That is, according to applicant's method, the braking force is further increased even after the quasi-static terminal state has been reached by actuating the wheel brake assembly for a brief period of time in the release direction and then again tightened. It is believed that by actuating the wheel brake assembly for a brief period of time in the release direction, the static friction in the wheel brake assembly is overcome, and the moving parts of the wheel brake assembly are once again put into motion. After being released, the wheel brake assembly is again tightened, and the subsequent braking force attained is greater than the braking force attained in the quasi-static terminal state, because the static friction in the wheel brake assembly need not be overcome.

Schenk et al discloses (Fig. 1.) a brake system using a pair of brake units (24 and 26) each unit having an electric motor (28 or 38) with non-backdriveable mechanical output members (30 or 32) and piezoelectric elements (36 or 46) that generate high forces with low expansion during rapid rates of change of applied voltage and are positioned in brake apply force-transmitting series with the motor output members (30 or 32). The piezoelectric elements are alternately energized with applied voltage and deenergized, in opposite phase relation. The piezoelectric expansion effect of each energized element is mechanically captured in each energization cycle by the motor unit having the deenergized element so that the brake apply forces actually applied to actuate the brake are increased beyond the maximum output of the motors. This is obtained by the alternating energization of the piezoelectric elements and the

alternating follow-up actions of the motors, with the non-backdrivable arrangements acting to store the mechanical force increases so attained.

To support a rejection of a claim under 35 U.S.C. § 102(b), it must be shown that each element of the claim is found, either expressly described or under principles of inherency, in a single prior art reference. See Kalman v. Kimberly-Clark Corp., 713 F.2d 760, 772, 218 USPQ 781, 789 (Fed. Cir. 1983), cert. denied, 465 U.S. 1026 (1984).

The examiner describes Schenk as disclosing a method for actuating a wheel brake assembly comprising the steps of (a) initially actuating the brake assembly in the tightening direction, (b) then actuating the wheel brake assembly for a brief period of time in the release direction, and (c) then again actuating the brake assembly in the tightening direction, said brief period of time being selected to be "so short that the braking force is reduced" (it is assumed the examiner meant to say --so short that the braking force is not reduced).

With regard to the wheel control system illustrated in Fig. 4, Schenk does disclose that crystals 136 and 146 can be cyclically energized and de-energized (see column 9, lines 35-39), but there is no teaching in Schenk that the period of time the crystals are de-energized is selected to be so short that any reduction of the braking force is imperceptible, as required by claims 8 and 9.

More particularly, Schenk uses two parallel-connected actuating units, each having a primary actuator (electric motors 28 or 38), a self-locking gear 30 or 40 for converting a rotary motion of the motor drive to a longitudinal motion, and a secondary actuator (piezoelectric actuators 36 or 46). Thus, Schenk uses a total of four actuators

to apply a braking force, of which the two piezoelectric actuators 36, 46 are alternately actuated, that is, when power is supplied to piezoelectric actuator 36, power is removed from piezoelectric actuators 46, and vice versa. See col. 5, ll. 14, 15. In addition, in the actuating unit having whichever piezoelectric actuator that is not supplied with power, the associated primary actuator (electric motor 28 or 38) must be supplied with power to drive the motor in the brake force applying direction, that is, in the tightening direction. Once the associated primary actuator reaches its maximum force output its associated piezoelectric actuator is supplied with power while power is removed from the other piezoelectric actuator. This braking operation is graphically illustrated in Fig. 2 of Schenk. At no time during the actuation of Schenk's brake system is it taught that the brake device is released to overcome the static friction existing in the brake system.

Further, nowhere in Schenk's description of the embodiment illustrated in Fig. 1 is there any teaching or suggestion of a method for actuating a mechanical system, such as, a wheel brake assembly, involving friction and having a spring elasticity to increase a force exerted by the system beyond a force attainable in a quasi-static state comprising the steps of actuating the system for a brief period of time in a release direction and then actuating the system in a tightening direction, the period of time of the actuation in the release direction being selected to be so short that any reduction of the force exerted is imperceptible. To the contrary, Schenk et al teaches the electric motors (28 and 38) are always actuated in the tightening direction during the brake applying phrase of operation (see Fig. 2). As a result, even when the piezoelectric element of a particular brake unit is deenergized, the brake unit (24 or 26), as a whole, is still actuated in the tightening direction.

Schenk et al also discloses (Fig. 4) a second embodiment including a wheel lock control. When actuated, this feature sets the output force generated by the motors, deenergizes the piezoelectric elements, and then concurrently energizes and deenergizes them to obtain a brake pumping action while preventing excessive wheel slip. Once again, Schenk et al teaches only that the piezoelectric elements are deenergized. There is no teaching of any actuation of the brake units in both directions during the brake applying phrase of operation or that Schenk is seeking a brief release of the brake device to overcome the static friction existing in the brake system.

In view of the above, Schenk et al does not anticipate claims 8 and 9 or claims 10-19 dependent on claim 8 or claim 9.

Independent claim 20 is even more specific than claim 8 or claim 9 and specifically recites a method for actuating an electromechanical wheel brake assembly having an electric motor, a brake actuator and means connecting the electric motor to the brake actuator for converting rotary motion of the electric motor into a translational motion. As explained in the specification, the method of the invention can be employed in existing electromechanical wheel brake assemblies (page 3, lines 1 -2) in which the connecting means may be a conversion gear, typically a spindle drive (page 1, line 18), a cam (page 2, line 3) or a nut of the spindle drive of the electric motor (page 2, line 3-4). The brake actuator may be a friction brake lining (page 1, line 19). The method comprising the steps of (a) initially actuating the electric motor in a tightening direction to cause the brake actuator to be pressed against a brake body to establish a quasi-static terminal braking state, then (b) actuating the electric motor for a brief period of time in a release direction opposite to the tightening direction, and then (c) again

actuating the electric motor in the tightening direction, said brief period of time of the actuation in the release direction being selected to be so short that any reduction of the braking force is imperceptible.

No where in Schenk's description of the embodiments illustrated in Figs. 1 and 4 is there any teaching or suggestion of a method for actuating an electromechanical braking system comprising the steps of (a) initially actuating the electric motor in a tightening direction to cause the brake actuator to be pressed against a brake body to establish a quasi-static terminal braking state, then (b) actuating the electric motor for a brief period of time in a release direction opposite to the tightening direction, and then (c) again actuating the electric motor in the tightening direction, said brief period of time of the actuation in the release direction being selected to be so short that any reduction of the braking force is imperceptible. To the contrary, Schenk et al teaches the electric motors (28 and 38) are always actuated in the tightening direction during the brake applying phrase of operation (see Fig. 2). As a result, even when the piezoelectric element of a particular brake unit is deenergized, the brake unit (24 or 26), as a whole, is still actuated in the tightening direction. Also, with respect to Fig. 4, Schenk et al teaches only that the piezoelectric elements are deenergized. There is no teaching of any actuation of the electric motors in both directions during the brake applying phrase of operation or that Schenk is seeking a brief release of the brake device to overcome the static friction existing in the brake system.

In view of the above, Schenk et al does not anticipate or render obvious claim 20 or claims 21-25 dependent on claim 20.

In accordance with the foregoing, applicant respectfully requests that the examiner reconsider and withdraw the outstanding rejections. If, however, the examiner feels that any further issues remain or require clarification, the examiner is cordially invited to contact the undersigned in order that any such issues may be promptly resolved.

Respectfully submitted,

Date: October 28, 2003

Ronald E. Greigg
Attorney for Applicants
Registration No. 31,517

GREIGG & GREIGG, P.L.L.C.
1423 Powhatan Street, Suite One
Alexandria, VA 22314
Tel. (703) 838-5500
Fax. (703) 838-5554

REG/JFG/clt